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(71) Applicant *(for all designated States except US)*: SMITHKLINE BEECHAM PLC [GB/GB]; New Horizons Court, Brentford, Middlesex TW8 9EP (GB).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: PARKER, David, Myatt [GB/GB]; SmithKline Beecham Consumer Brands, The Royal Forest Factory, Coleford, Gloucestershire GL16 8JB (GB).

(74) Agent: WHITE, Susan, Mary; SmithKline Beecham, Corporate Intellectual Property, Two New Horisons Court, Brentford, Middlesex TW8 9EP (GB).

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(57) Abstract

Acidic oral compositions having reduced tooth erosion characteristics, especially acid beverages such as fruit juice drink concentrates, or oral healthcare products such as mouthwashes, are prepared by adding a calcium compound to the acid composition so that the mol ratio of calcium to acid ranges from 0.3 to 0.8, and the pH of the composition, if necessary after adjustment with an alkali, is from 3.5 to 4.5.

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LIQUID ORAL COMPOSITIONS COMPRISING A CALCIUM COMPOUND AND AN ACIDULANT

The present invention relates to compositions for oral use, such as acidic beverages and oral healthcare compositions, and to the use of calcium in such compositions to alleviate or prevent the tooth damage associated with the consumption of acid. In particular, the present invention alleviates palatability problems associated with calcium addition to beverages.

It is thought that erosion of teeth is caused *inter alia* by acidic foodstuffs leaching out calcium from the teeth faster than it can be replaced by normal remineralisation processes. When a product such as a beverage is prepared in accordance with this invention, and introduced into the oral cavity for consumption or healthcare purposes, the dissolution or removal of calcium and phosphate from teeth by chemical processes is significantly reduced.

Calcium is the most abundant mineral in the body. The vast majority of calcium is deposited in the bones and teeth but the mineral is also essential for other bodily functions such as the regulation of nerve function, the contraction of muscles and clotting of blood. Calcium is a common constituent of beverages being derived from fruit ingredients and from hard water when this is used in beverage production without prior softening. Values for the concentration of calcium occurring in this way are typically in the range 0.005-0.02% w/w. Interest in the general nutritional benefits of diet fortification by calcium ion has led to a search for practical ways to incorporate this ion in beverages at higher levels from 0.02% w/w to 2% w/w. The use of calcium as a supplement for beverages has been described in WO88/03762.

It is well known that the addition of malic acid will help maintain the solubility of calcium in calcium fortified beverages therefore minimizing losses due to precipitation. This is because of the formation of a soluble complex "calcium citrate malate". On the other hand, Lussi et al (1995, Caries Res 29, 349-354) have associated the titratable acidity of a beverage with its erosive potential; the greater the concentration of acid in the beverage the more damaging to teeth it became.

In PCT US 91/07117 there is disclosed a method for preventing the erosion of tooth enamel by consuming an acid beverage (having a pH of less than 5.5) comprising from 0.02% to 0.15% of calcium in the form of a calcium citrate malate complex having a molar ratio of citrate to malate of 1:0.5 to 1:4.5. In the calcium citrate malate complexes the molar ratio of total moles calcium:total moles citrate:total moles malate may be from about 2:1:1 to about 6:3:4. A preferred complex for beverages has the molar ratio 4:2:3.

We have found that inclusion of high levels of calcium in beverages gives palatability problems. The present invention is based on the discovery that effective reduction of tooth erosion in acidic oral compositions can be achieved with lower amounts of calcium relative to the acidulant when the pH of the composition is also controlled.

In one aspect, the present invention provides a liquid composition for oral use containing a calcium compound and an acidulant characterised in that calcium is present in the range of 0.3 to 0.8 mol per mol of acid and that the amount of calcium and acidulant in the composition is selected so that the pH of the composition is from 3.5 to 4.5.

In another aspect, the present invention provides the use of calcium as a tooth erosion inhibitor in an acidic liquid composition for oral use by adding a calcium compound to the composition so that calcium is present in the range of 0.3 to 0.8 mol per mol of acid , the amount of calcium and acidulant in the composition being selected so that the pH of the composition is from 3.5 to 4.5.

In a further aspect, the present invention provides a method of reducing the tooth erosion properties of an acidic oral composition which comprises adding a calcium compound to the acidic liquid oral composition so that calcium is present in the range of 0.3 to 0.8 mol per mol of acid , and if necessary or desired adjusting the pH by addition of an alkali so that the pH of the composition is from 3.5 to 4.5.

In a still further aspect, the present invention provides a process for preparing a composition of this invention which comprises adding a calcium compound to an acidic liquid oral composition so that calcium is present in the range of 0.3 to 0.8 mol per mol of

acid . and if necessary or desired adjusting the pH by addition of an alkali so that the pH of the composition is from 3.5 to 4.5.

The present invention is applicable to aqueous acidic substances for oral consumption such as acidic beverages, fruit juices. ciders, wines. vinegars and pickles and diverse acidic dairy products and also to other liquid substances to be taken orally such as acidic mouth washes and medicines.

Practice of the present invention does not cause taste defects in beverages. Although the increase in pH of a beverage to around pH 4 would be expected to reduce the sharpness in taste provided by the acidulant, surprisingly the inclusion of calcium in accordance with this invention mitigates this.

A further advantage arises from the use of low levels of calcium in accordance with this invention in the form of an alkaline salt. The buffering capacity of the formulation is reduced by partial neutalization of the acid, which allows saliva to neutralise residues in the mouth more rapidly.

The absolute concentration of calcium used in the present invention is not critical as this will vary according to the nature and concentration of the acids present. The acid solution may contain organic and/or inorganic acids and may be supplemented with vitamins such as ascorbic acid. In a concentrated beverage, to be diluted with up to five parts of water prior to consumption, the calcium concentration may vary from 0.001 mol. per litre to more than 0.05 mol. per litre. In a ready to drink beverage the calcium ion concentration may vary from 0.0002 mol. per litre to more than 0.01 mol. per litre.

The calcium may be added as any convenient salt such as calcium carbonate, calcium hydroxide. calcium citrate. calcium malate, calcium lactate, calcium chloride. calcium glycerophosphate or calcium formate or any other salt to minimize any adverse flavour contribution to the composition.

The invention may be carried out by mixing the acid (e.g. citric acid) with its corresponding calcium salt (e.g. calcium citrate) or another calcium salt. It may be advantageous to mix the acid with an alkaline calcium salt such as calcium carbonate or calcium hydroxide thereby minimizing the concentration of acid applied to the formulation. The acid can also be mixed with inorganic calcium salts such as calcium chloride.

The molar ratio of calcium to acid may be 0.3 - 0.75, more typically 0.3 - 0.65, preferably 0.3 - 0.55. Most preferably the molar ratio is at least 0.4, and a value of about 0.5 has been found to be especially effective.

The pH of the formulation may be adjusted to the desired range by the addition of the calcium compound to the appropriate proportion relative to the acid. If necessary, depending on the acid present, the pH may be further adjusted by the application of an alkali e.g. sodium hydroxide or a suitable salt for example sodium citrate, sodium malate or sodium lactate.

The pH of the composition is preferably not more than 4, most preferably from 3.7 to 3.9. Compositions with a pH of about 3.8 have been found to be especially effective.

Typical citric or malic acid concentration in a concentrated fruit beverage would be in the range 0.1% w/w to 4% w/w. In a ready to drink beverage, acid concentrations are typically in the range 0.01% w/w to 1% w/w. Other potable acids conventional for beverages may also be used, such as lactic acid. Mixtures of potable acids may be used.

In a preferred embodiment, the acid composition is a drink concentrate prepared from a natural fruit juice, such as blackcurrant juice, for example a flavoured syrup concentrate. The calcium may be added in a suitable form either to the concentrate, especially when the beverage is sold to the consumer as a concentrate for dilution before drinking, or when diluting the syrup concentrate for preparation of a "ready to drink" diluted concentrate. Preferably the product contains reduced levels of sugar or carbohydrate or is of low calorie type containing intense sweeteners.

The oral composition may contain magnesium or other ions as adjuncts for remineralisation. It may also contain an effective amount of malic acid or potable salts thereof to maintain the solubility of the calcium so as to prevent or minimize the precipitation of insoluble calcium salts. Added malic acid may provide as little as 10% of the total acidity of the beverage, the remainder of the acidity being provided by other, preferably naturally present, acids such as citric acid, or by ascorbic acid.

The invention may be applied in a variety of beverages such as concentrates, still fruit drinks, or carbonated soft drinks and in particular to health drinks such as blackcurrant juice drinks or vitamin added beverages. The invention is advantageously applied to drinks containing natural or added citric acid. The beverages may be unsweetened or sweetened with sugar or intense sweeteners such as saccharine, aspartyl phenyl alanyl methyl ester, or other sweeteners known in the art. The beverages may also contain other conventional additives such as sodium benzoate, sorbic acid, sodium metabisulfite, ascorbic acid, flavourings, colourings and carbon dioxide.

The beverages may be prepared by mixing the ingredients according to conventional methods. The solid ingredients may be dissolved in water or in hot water if required prior to addition to the other components. Typically drinks are pasteurised prior to filling in bottles or cans or other packs or are "in-pack pasteurised" after filling.

The invention is illustrated by the following Examples:

Example 1

A concentrated beverage product, for dilution with five parts of water prior to consumption was prepared by mixing the ingredients as follows. The calcium carbonate was added to the other ingredients as a final addition.

Blackcurrant juice concentrate	SG 1.27	84 litre
Aspartyl phenyl alanyl methyl ester	*	1.15 Kg
Acesulfame K		1.8 Kg
Ascorbic acid		0.8 Kg
Sodium benzoate		0.325 Kg
Sodium metabisulfite		0.145 Kg

Blackcurrant flavouring		0.3 litre
Water	up to final volume	1000 litre
Calcium carbonate		4.2 Kg
*sold as Aspartame (RTM)		

The mol ratio of calcium : acid is 0.5

The concentrate is adjusted to pH 3.7 with sodium hydroxide solution. On dilution of the concentrate with five parts water (to drinking strength), the pH of the composition is typically found to be 3.85.

In-vitro planometry tests were performed in which flat dental enamel sections were exposed to test solutions at a temperature of 37°C for 30 minutes. Erosive potential was evaluated by physical measurement of the depth of enamel lost during the procedure. Whereas a control formulation comprising 14 mM citric acid, pH 3.2 resulted in a loss of 4 microns of enamel and a further control formulation of 14 mM citric acid, pH 3.85, removed 1.8 microns. a test formulation with adjusted pH and added calcium comprising 14 mM citric acid, 7 mM calcium, pH 3.85 removed only 0.17 microns of enamel, demonstrating the utility of the invention.

Example 2

A ready to drink beverage was prepared by mixing ingredients as follows:

Ingredients		%w/w
Sugar		10
Sodium benzoate		0.01
Orange juice		5.04
Ascorbic acid		0.03
Citric acid monohydrate		0.15
Flavouring		0.005
Colouring		0.004
Water	by difference	86
Calcium carbonate		0.048
Sodium hydroxide	sufficient to adjust to pH 3.9	
Carbon dioxide		0.48

In this beverage the mol ratio of calcium : acid is 0.46 (orange juice is typically 1 % w/w citric acid)

Example 3

A ready to drink beverage was prepared by mixing ingredients as follows:

Ingredients		%w/w
Sugar		8
Sodium benzoate		0.01
Apple juice		10
Ascorbic acid		0.03
Malic acid		0.15
Flavouring		0.005
Colouring		0.004
Water	by difference	82
Calcium carbonate		0.093
Sodium hydroxide	sufficient to adjust to pH 3.9.	

In this beverage the mol ratio of calcium : acid is 0.74 (apple juice is typically 0.6 % w/w malic acid)

Example 4

***In vivo* study**

A beverage was produced by mixing ingredients as follows:

Blackcurrant concentrate	16.78 litres
Aspartyl phenyl alanyl methyl ester	0.54 kg
Acesulfame K	0.11 kg
Ascorbic acid	0.45 kg
Flavouring	0.55 litres
Calcium hydroxide	0.52 kg
Water	to 1000.00 litres

The calcium hydroxide was added as a slurry with a portion of the water as a final addition and was sufficient to produce a beverage containing calcium in a molar ratio of 0.5:1 calcium to citric acid . The resultant beverage had a pH of 3.8. The batch was flash pasteurised and packed into 250ml "Tetra-Brik" containers.

In this study, loss of human enamel was compared between three beverages: the above example, an orange juice as a positive control (pH 3.8) and water as negative control.

Twelve volunteers participated in the study in a three-treatment Latin square crossover design. Each study period consisted of three weeks each consisting of five weekdays. In each study period, a section of enamel from an extracted healthy tooth was worn in an appliance for seven hours each weekday. On four occasions during this period 250 ml of the test beverage was sipped gradually, under supervision, during a period of ten minutes. The subjects were permitted to remove the appliance to consume a mid-day meal but were not allowed to consume foods or other beverages whilst the appliance was in place. The enamel specimen underwent measurement by planometry (the principles of the method have been described by Davis and Winter (1977) British Dental Journal 143, 116-119) at the start of the treatment period and at the end of each treatment week. All readings were performed in duplicate. After a washout period, each subject then commenced the next treatment period with a fresh enamel specimen. The results are given in the following table and represent microns of enamel lost by the given treatment after the given exposure time and are the means found for the twelve subjects.

	5 days	10 days	15 days
water	0.098	0.153	0.166
blackcurrant	0.341	0.376	0.407
orange juice	0.911	1.459	2.543

The results demonstrate that the blackcurrant formulation was found to be minimally erosive, barely more erosive than water, and highly significantly less erosive than orange juice.

Example 5

***In-vitro* study**

To investigate the importance of calcium supplementation on exposure of enamel to citric acid solutions, five experiments were undertaken, each using eight teeth. The teeth were first subjected to prophylaxis, washed with saline and then covered in an acid resistant wax with the exception of a 5 mm diameter experimental window.

In each experiment the teeth were subjected to six consecutive 5 min exposures with 0.3% citric acid solutions at a flow rate of 0.1 ml/min. The citric acid solutions were supplemented with either 0.0, 0.5, 1.5, 2.5, 5.0, 7.5 10 or 15 mM calcium in the form of calcium hydroxide and the pH was adjusted to 3.5 or 3.8 using 1.0 M sodium hydroxide. Samples of residual citric acid were collected after every 5 min exposure of the teeth and these were frozen at -4°C, prior to phosphorus analysis by the method of Chen et al (1956) Analytical Chemistry, Vol.28, p1956-8.

The results are illustrated below

calcium	mol ratio	Mean amount Phosphorus liberated (μg) ± 1 SD	
(mM)	calcium:acid	pH 3.5	pH 3.8
0	0.00	1.41 ± 0.11	1.26 ± 0.17
0.5	0.03	1.25 ± 0.14	1.02 ± 0.09
1.5	0.10	1.07 ± 0.15	0.83 ± 0.12
2.5	0.17	1.22 ± 0.14	0.63 ± 0.13
5	0.35	0.79 ± 0.06	0.46 ± 0.13
7.5	0.52	0.72 ± 0.1	0.32 ± 0.10
10	0.70	0.46 ± 0.13	0.24 ± 0.11
15	1.05	0.3 ± 0.10	0.14 ± 0.07

This experiment clearly illustrates that addition of calcium to a 0.3% citric acid solution reduces its erosive potential. The effect is greatest up to a calcium to acid molar ratio of about 0.5 (approximately 7.5 mM calcium). No justifiable increase in erosive potential can be achieved by increasing the calcium : acid molar ratio much beyond this point.

Example 6

A flavoured concentrate was prepared by mixing the following ingredients together with stirring. The calcium hydroxide was added last as a slurry in cold water and the volume adjusted to 1000L with water.

Ingredient	Unit	Quantity
Blackcurrant Concentrate	L	67.1
Sweetener	Kg	3.33
Ascorbic Acid	Kg	2.28
Preservatives	Kg	.0.45
Flavouring	L	1.2
Calcium Hydroxide	kg	2.96
Water to 1000 litres		

The beverage concentrate was flash pasteurised at 93°C for 42 seconds and filled into 600ml bottles. The molar ratio of calcium to citric acid was 0.4 and the final pH was 3.7.

On dilution with five parts water to drinking strength the pH of the composition was found to be 3.85 and the flavour of the drink was described as being typical fruity blackcurrant.

The beverage concentrate was tested for storage stability both at ambient and at 30°C. After a period of 9 months no precipitation of insoluble calcium was observed.

Example 7

***In vivo* study**

A beverage was produced by mixing ingredients as follows:

Blackcurrant concentrate		10.07 litres
Aspartyl phenyl alanyl methyl ester		0.21 kg
Acesulfame K		0.07 kg
Ascorbic acid		0.27 kg
Lactic acid 80% w/w		0.66 litres
Potassium sorbate		0.1 kg
Sodium metabisulfite		0.02 kg
Flavouring		0.56 litres
Calcium hydroxide		0.52 kg
Water	to	600.00 litres

The calcium hydroxide was added as a slurry with a portion of the water as a final addition and was sufficient to produce a beverage containing calcium in a molar ratio of 0.45:1 calcium to citric acid / lactic acid. The resultant beverage had a pH of 3.85. The batch was packed in 250ml containers and "in-pack" pasteurised.

In this study, loss of human enamel was compared between four beverages: the above example, a commercially available blackcurrant fruit drink with a pH of 3.0 and no added calcium, an orange juice as a positive control (pH 3.9) and water as negative control.

Twelve volunteers participated in the study. Each study period consisted of three weeks each consisting of five weekdays. In each study period, a section of enamel from an extracted healthy tooth was worn in an appliance for seven hours each weekday. On four occasions during this period 250 ml of the test beverage was sipped gradually, under supervision, during a period of ten minutes. The subjects were permitted to remove the appliance to consume a mid day meal but were not allowed to consume foods or other beverages whilst the appliance was in place. The enamel specimen underwent measurement by planometry (the principles of the method have been described by Davis and Winter (1977) British Dental Journal 143, 116-119) at the start of the treatment period and at the end of each treatment week. All readings were performed in duplicate. After a washout period, each subject then commenced the next treatment period with a fresh enamel specimen.

The results are given in the following table and represent microns of enamel lost by the given treatment after the given exposure time.

	15 days
water	0.11
blackcurrant	0.39
commercial blackcurrant	1.44
orange juice	1.29

The results demonstrate that the blackcurrant formulation was found to be minimally erosive, barely more erosive than water, and highly significantly less erosive than orange juice or the commercial blackcurrant drink.

Example 8

A cola concentrate was prepared by mixing the following ingredients together

orthophosphoric acid SG 1.585	41 l
citric acid	120 Kg
caffeine BP	5.3 Kg
cola emulsion	29.25 l
caramel double strength	125 l
water to	400 l

A cola syrup with a throw of 1+5 was then prepared by mixing the following ingredients together

Aspartyl phenyl alanyl methyl ester	1.8 Kg
soluble saccharin	500 g
cola concentrate	25 l
cola booster	600 mls
calcium hydroxide	3.108 Kg
water to	1000 l

The calcium hydroxide was added as a slurry with a portion of the water as a final addition and the cola syrup was then diluted with carbonated water, canned and in-pack pasteurised to produce a finished product with a pH of 3.5 and a calcium to acid molar ratio of 0.6.

Example 9

A mouthwash was prepared by mixing the following ingredients :

	%W/W
ethanol 96% BP	8
soluble Saccharin	0.06
cetylpyridinium chloride	0.05
Tego Betain CK-KB5	0.2
flavouring	0.12
sodium acetate trihydrate	0.05
acetic acid 80%	0.1575

calcium chloride dihydrate	0.123
deionised water	91.24

The ethanol, cetylpyridinium chloride, Tego Betain CK-KB5 (Trade Mark for a cocamido propyl betaine) and flavouring were mixed together to form a clear solution. In a separate container the remainder of the ingredients were mixed together. The ethanolic solution was then added to the aqueous solution to produce a mouthwash with a pH of 4.5 and a calcium to acid molar ratio of 0.4.

Example 10

A ready to drink beverage was prepared by mixing ingredients as follows:

Ingredients		%w/v
Sodium benzoate		0.01
Malic acid		0.30
Flavouring		0.1
Artificial sweetener		0.05
Water	by difference	99.5
Calcium hydroxide		0.083

The resultant pH of the composition is typically found to be 3.85 and has a calcium to acid molar ratio of 0.5.

In vitro planometry tests were performed in which flat dental enamel sections were exposed to test solutions at a temperature of 37°C for 30 minutes. Erosive potential was evaluated by physical measurement of the depth of enamel lost during the procedure. Whereas a control formulation lacking the addition of calcium hydroxide gave a pH of 2.5 and resulted in a loss of 8.1 microns of enamel and a further control formulation in which the pH of the beverage had been increased to pH 3.85 with sodium hydroxide removed 1.65 microns, the composition detailed above removed only 0.6 microns of enamel, demonstrating its utility in reducing tooth erosion.

CLAIMS

1. A liquid composition for oral use containing a calcium compound and an acidulant characterised in that calcium is present in the range of 0.3 to 0.8 mol per mol of acid and that the proportion of calcium and acidulant in the composition is selected so that the pH of the composition is from 3.5 to 4.5.

2. A composition as claimed in claim 1 in which the calcium is present in the range 0.3 - 0.75 mol per mol of acid .

3. A composition as claimed in claim 1 in which the calcium is present in the range 0.3 - 0.65 mol per mol of acid .

4. A composition as claimed in claim 1 in which the calcium is present in the range 0.3 - 0.55 mol per mol of acid .

5. A composition as claimed in any one of claims 1 to 4 in which the calcium is present in an amount of at least 0.4 mol per mol of acid .

6. A composition as claimed in any one of claims 1 to 5 in which the pH of the composition is not more than 4.

7. A composition as claimed in any one of claims 1 to 5 in which the pH is from 3.7 to 3.9.

8. A composition as claimed in any one of claims 1 to 7 in which the acid is citric acid or malic acid or lactic acid or mixtures thereof.

9. A composition as claimed in any one of claims 1 to 8 in which the calcium compound is calcium carbonate, calcium hydroxide, calcium citrate, calcium malate, calcium lactate, calcium chloride, calcium glycerophosphate or calcium formate.

10. A composition as claimed in any one of claims 1 to 9 which is a beverage.

11. A composition as claimed in claim 10 in which the beverage is a still fruit drink. or a carbonated soft drink or preferably a health drink.

12. A composition as claimed in claim 11 in which the health drink is blackcurrant juice drink or a vitamin added beverage

13. A composition as claimed in any one of claims 1 to 9 which is a drink concentrate for the preparation of a beverage.

14. A composition as claimed in claim 13 which is a concentrate for a fruit drink or health drink.

15. A composition as claimed in any one of claims 1 to 9 which is an oral healthcare composition.

16. A composition as claimed in claim 15 which is a mouthwash.

17. Use of calcium as a tooth erosion inhibitor in an acidic liquid composition for oral use by adding a calcium compound to the composition so that calcium is present in the range of 0.3 to 0.8 mol per mol of acid , the amount of calcium and acidulant in the composition being selected so that the pH of the composition is from 3.5 to 4.5.

18. Use as claimed in claim 17 in which the calcium is present in the range 0.3 - 0.75 mol per mol of acid .

19. Use as claimed in claim 17 in which the calcium is present in the range 0.3 - 0.65 mol per mol of acid .

20. Use as claimed in claim 17 in which the calcium is present in the range 0.3 - 0.55 mol per mol of acid .

21. Use as claimed in any one of claims 17 to 20 in which the calcium is present in an amount of at least 0.4 mol per mol of acid .

22. Use as claimed in any one of claims 17 to 21 in which the pH of the composition is not more than 4.

23. Use as claimed in any one of claims 17 to 21 in which the pH is from 3.7 to 3.9.

24. Use as claimed in any one of claim 17 to 23 in which the acidic liquid composition is a natural fruit juice drink concentrate.

25. A process for preparing a composition as claimed in any one of claims 1 to 16 which comprises adding a calcium compound to an acidic liquid oral composition so that calcium is present in the range of 0.3 to 0.8 mol per mol of acid , and if necessary or desired adjusting the pH by addition of an alkali so that the pH of the composition is from 3.5 to 4.5.

26. A process as claimed in claim 25 in which the acidic liquid composition is a natural fruit juice drink concentrate.

27. A method of reducing the tooth erosion properties of an acidic oral composition which comprises adding a calcium compound to the acidic liquid oral composition so that calcium is present in the range of 0.3 to 0.8 mol per mol of acid , and if necessary or desired adjusting the pH by addition of an alkali so that the pH of the composition is from 3.5 to 4.5.

28. A method as claimed in any one of claims 17 to 21 in which the acidic liquid composition is a natural fruit juice drink concentrate.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter. nal Application No
PCT/EP 97/00646

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 97/00646

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A23L2/52 A23L2/68 A23L1/304 A61K33/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A23L A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 634 110 A (ECKES AKTIENGESELLSCHAFT) 18 January 1995	1-11, 17-23, 25,27
Y	see page 5, line 6 - line 26; example 4 ---	1-28
X	EP 0 227 174 A (PROCTER & GAMBLE) 1 July 1987	1-3,5, 8-11,13, 25
Y	see page 3, line 41 - line 51; example 2 ---	1-28
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
19 June 1997	07 July 1997 (07.07.97)

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 97/00646

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 88 03762 A (UNIV TEXAS ;MISSION PHARMA CO (US)) 2 June 1988 cited in the application see example 2; table 2	1,2, 5-10,25
Y	GB 1 516 525 A (PROCTER & GAMBLE) 5 July 1978 see page 1, line 12 - line 18; example 3 see page 2, line 80 - line 87	1-28

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